Original Articles.

THREE CASES OF EXTRA-DURAL ABSCESSES; OPERATIONS AND RECOVERIES.

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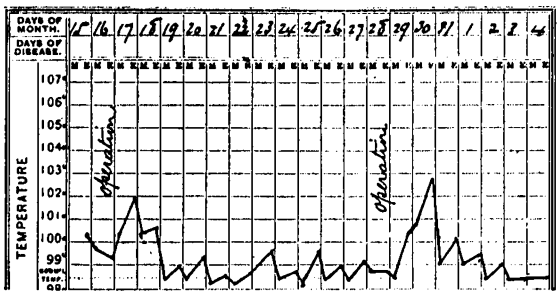
CASE I. Fracture of the skull, infection and extra-dural abscess.

M. E., an unusually strong, healthy man, aged twenty-seven, about November 1, 1895, jumped from a rapidly-moving electric car, received a scalp wound over the left parietal bone, and was unconscious for a short time. The scalp wound was stitched at the time. Shortly after the accident there was bleeding from the left meatus, followed by a serous discharge for two or three days only. Two weeks after, he began to have pain in the ear; and at the end of another fortnight an edematous swelling appeared above the auricle and extended so far forwards as to close the left eye. There was no dizziness, no nausea and no headache, the pain consisting of occasional sharp shoots from the ear into the left temple. The tests were, W. l. c/100, V. l. 1/25 and Weber, localized in the affected side; by Valsalva's inflation there was no perforation whistle.



He entered the infirmary on December 15th. There was a diffuse swelling of the upper wall of the osseous meatus, and below this granulation tissue which completely concealed the deeper parts. The external swelling was entirely above the linea temporalis and zygoma; was edematous and extended forwards to the eye and upwards half-way to the vertex to the cicatrix of the original wound; it was most prominent two inches above the auricle, where a distinct crater with fluctuation could be felt. There was no sensitiveness of the mastoid. Under ether the swelling was incised freely at the crater, over the original cicatrix and over the temporal fossa; no collection of pus was found, but there was bare bone at the crater and in the temporal fossa. The three openings were connected by drainage-tubes and dressed daily with douching with sublimate 1–3,000, and the meatus was similarly treated.

December 21st. The bare bone had covered with granulations except one small spot at the crater; the ear was dry, and all swelling had disappeared; the drainage-tubes were removed and iodoform gauze substituted. All pain had ceased.

December 28th. A probe was found to enter a small carious hole in the bone at the position of the crater; under ether the bone was fully exposed, and two fractures of the temporal bone were seen, one beginning just above the zygoma, running upwards and backwards, and one from the squamous suture downwards and forwards; at the junction of the two was a carious perforation three-sixteenths of an inch in diameter, filled with exuberant granulations from the dura. The opening was enlarged with rongeurs to nearly an inch in diameter, evacuating some three drachms of inodorous pus. The anterior edge of the fracture was depressed about one-sixteenth of an inch below the posterier edge, but attempts to raise it were futile; the upper fracture extended into the parietal bone but was not exposed, as a probe passed beneath the periosteum showed a perfectly smooth surface. The area of granulating dura did not extend beyond the opening in the bone, as was seen by pushing the dura inwards; the dura itself was pulsating distinctly. The granulations were not removed, the whole wound was douched with corrosive solution, 1–5,000, the upper portion sutured and the rest packed lightly with iodoform gauze. Convalescence was uninterrupted; the wound was septic, was dressed daily, then every second, then every third day. It gradually closed by granulation, and on February 26th was entirely healed. The inflammation of the ear was confined to the meatus, and was healed within a few days after the first operation. More than a year afterwards the patient was in perfect health.

CASE II. Infection of the tympanum, caries of the antrum-roof and extra-dural abscess.

J. H., a strong, healthy man, aged forty, from a cold in April, 1896, had earache, for which he applied at the infirmary, where a paracentesis was done, and the ear discharged purulent fluid for one week, and then the discharge ceased. The earache returned; another paracentesis was done; the discharge continued for about a week, then ceased from closure of the perforation. This history kept repeating itself: earache, complete relief from a paracentesis as long as the discharge continued; with closure of the perforation, gradual return of the pain. Between April 14th and November 1st, ten paracenteses were required.

On November 10th he began to have the old symptoms, five days from the cessation of the last discharge; the left membrana tympani was swollen and injected so that all landmarks had disappeared, but there was no localized bulging. He complained of pain in the ear and over the side of the head; there was no tenderness of the mastoid, but distinct sensitiveness over an area two inches in diameter on the squamous bone, just above the linea temporalis, and another sensitive spot two and a half inches upwards and backwards from the auricle over the parietal bone. A paracentesis evacuated a sero-purulent fluid, and a culture taken from within the tympanum showed infection with the staphylococcus aureus (Dr. Daley). The temperature was 99° F. Arguing that, from the history, there was some focus of inflammation not yet reached which was continually re-infecting the tympanum, I advised exploration of the mastoid.

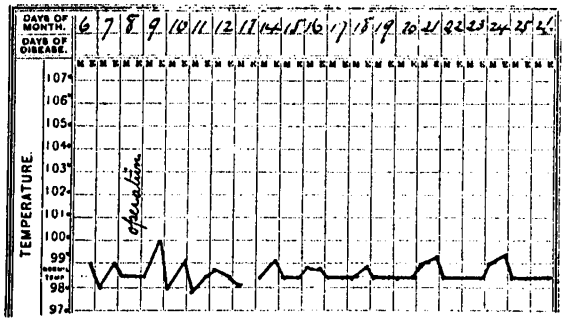
November 13th the mastoid was opened; the cortex was not inflamed; the interior was partly pneumatic and partly hyperostosed, inflamed, but without any large collection of pus. The roof of the antrum was destroyed by caries, and about a drachm of pus was evacuated from between the dura and the squamous bone. The opening was enlarged upwards, exposing the dura for about half an inch, or as far as the pus seemed to extend. All carious bone was curetted away, the cavity cleansed by wiping and packed with iodoform gauze.

November 17th there was some oozing on the dress-

ing, which was changed; and on account of eczema of the auricle, sterile gauze was substituted for iodoform gauze.

November 18th the perforation of the drum-membrane had healed; the dural cavity was discharging slightly, and was dressed daily. It gradually filled up by granulations. All pain had been entirely relieved from the day of the operation, and the patient was about the ward, but a slight discharge continued from the dura.

On January 7th he again complained of pain in and about the ear, but without any return of pus in the tympanum; and at the spot of sensitiveness over the parietal bone, first noticed on his admission, was an area of edema about three-quarters of an inch in diameter. Under ether the tissues were incised, the periosteum reflected, and a fistula through the bone three-eighths of an inch in diameter exposed; this was enlarged with rongeurs and the dura found covered with granulations nearly half an inch in height. The bone was then removed in every direction with rongeurs till the opening extended beyond the area of dural granulations, making an opening in the skull about two inches in diameter. The granulations were covered with pus, but no marked collection was found except



in the extreme posterior portion of the wound, where two drachms were evacuated, which I at first thought came through a fistula in the dura; but on removing the granulations with a curette, the dura was found to be unperforated, and the collection of pus was evidently a pocket in the granulation tissue. The galvano-cautery was used to check obstinate oozing in the scalp, the upper parts of the wound were united by sutures and the rest packed with aseptic gauze.

From this time there was no further pain; the wound remained completely aseptic and was dressed about every fifth day; convalescence and healing were rapid. On January 13th he was allowed his clothes; and on February 1st went home, returning for occasional dressing. On March 17th both the dural and mastoid wounds were entirely healed; the tympanic swelling had been subsiding gradually, but had not then wholly disappeared; the hearing for the voice was 3/25; the general condition perfect. No signs of the cranial opening could be felt: it was apparently closed firmly by bone.

The temperature chart is interesting in that it gave no indication of the serious condition within the skull, 99°F. being the highest record just before operation, when there was extensive suppurative pachymeningitis going on. The aseptic condition attained in the wound I attribute entirely to the very thorough removal of the granulations by the curette. The case is further interesting, not only in showing the insidious character of some of the otitic brain complications, but also the value of thoroughly exposing the ear-cavities and following the disease inward wherever it may lead.

CASE III. Chronic suppuration of the tympanum, caries of the antrum-roof and extra dural abscess.

J. McG., a woman, aged twenty-one, with a chronic suppuration of the left tympanum of eight months' duration entered the infirmary on November 6, 1896, complaining of pain in the ear for the last four days. The lower half of the drum-membrane was destroyed, and through the perforation a medium-sized polypus projected, which was removed with the snare, and bare bone was felt on the promontory. The mastoid, antrum and tip were slightly sensitive to pressure, but without external swelling.

Under the use of Leiter's ice-coil to the mastoid and hot douching of the meatus, both the pain in the ear and the sensitiveness of the mastoid improved until November 11th, when she waked at 1 A. M. complaining of severe pain in the ear, which was soon followed by a severe chill lasting half an hour; after this she slept well, and the next day appeared as usual till 3 P. M., when she had another severe chill with a temperature of 107.4° F. The temperature fell six degrees in the next hour but the patient was delirious, vomiting and very restless, and once there was distinct twitching of the right hand for two or three minutes. Examination of the eyes by Dr. Carleton showed no marked changes in the optic nerves. Dr. James J. Putnam saw her with me, and although the delirium had passed into unconsciousness and the pulse was very weak, it was decided to operate.

Before etherization one-thirtieth of a grain of strychnia was given hypodermatically. On exposure of the mastoid, the cortex was apparently not inflamed; but on opening it with the gouge and mallet, about two drachms of very offensive pus was evacuated, but pus continuing to appear from the upper posterior portion of the mastoid, the roof of the antrum was fully exposed and found to be carious over a spot about one-quarter of an inch in diameter, and pus was exuding from within the skull through a carious fistula. The dura of the cerebrum was exposed by removing the entire roof of the mastoid and for half an inch up the squamous bone through the linea temporalis; it was covered with red granulations over the carious bone and red, but smooth, for about half an inch around the granulations. The entire amount of pus within the cranium was only a few drops. The wound was cleansed by wiping, and packed with iodoform gauze. The pulse improved steadily from the time the bone was opened, and four hours after the operation consciousness returned and she recognized her father. Strychnia, one-thirtieth of a grain, was given after the operation.

November 12th. She was perfectly conscious and free from pain.

November 13th. The dressings were changed; there was a small amount of offensive pus in the depth. Dr. Daley reported streptococci and a bacillus, single and combined, in the culture from the operation; the bacillus resembling somewhat, but not absolutely, the tubercle-bacillus.

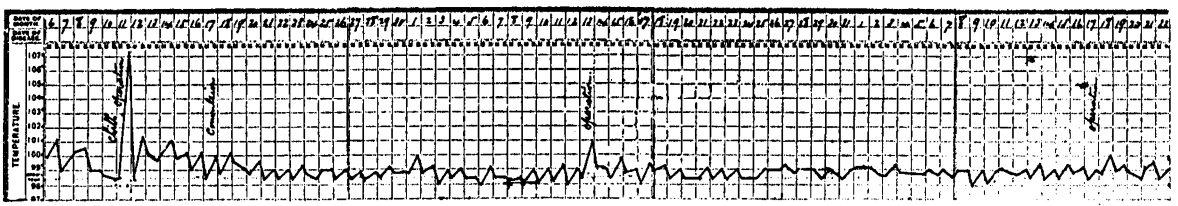
November 14th. Very comfortable, taking nourishment well.

November 15th and 16th. About the same, but some pain in the ear.

November 17th. Involuntary urination six times, and a convulsion lasting three minutes, with limbs rigid, head thrown back, eyes staring and frothing at the mouth, followed by dulness of intellect and wrong answers to questions. A change of dressings and evacuation of about three drops of pus seemed to give relief, and she became perfectly rational again.

For the next three weeks the patient gained steadily; there were no more convulsions, very little pain, no return of delirium; most of the time she was bright and cheerful, although occasionally fretful, but every night the urine was voided involuntarily during sleep. The wound was dressed daily, the pus became more abundant and more offensive, and as carious bone could be felt in the wound another operation was advised.

December 13th. Under ether the squamous bone was exposed, a part found loosened, and a semilunar sequestrum one and a quarter inches long and seven-



eighths of an inch broad, was removed, evacuating about an ounce of yellowish-green, very offensive pus. The dura was covered with granulations. The sequestrum was eroded externally, but its inner surface was smooth and showed the groove of the middle meningeal artery.

For the next five weeks, although the general condition steadily improved and the patient was about the ward, the discharge continued abundant and very offensive, both from the mastoid and from a pocket between the dura and the squamous bone, and any retention of pus in this pocket produced headache. Examination of the blood by Dr. Putnam showed leucocytosis.

As carious bone could be felt in the mastoid and was suspected again in the squamous, on January 17, 1897, a third operation was performed by an incision upwards and backwards from the previous cut, which revealed newly-formed bone with pus exuding from beneath it; this was removed by the rongeur, and the greater portion of the squamous found to be a loose sequestrum, which was removed, evacuating two drachms of very offensive pus. The dura was covered with soft granulations, which were entirely removed with the curette, leaving the membrane smooth. The second step of the operation consisted in thoroughly clearing out the mastoid, where at the depth of an inch and a half forwards, a second sequestrum was felt and removed; this proved to be the posterior portion of the labyrinth including two of the semicircular canals. The entire field of operation was douched with distilled water and packed with idoform gauze. There were now three wounds: one to the dura, and one to the labyrinth and a purulent tympanum. The two first continued aseptic, granulated rapidly, and in three days the communication between the mastoid and tympanum had closed. By February 5th the dural wound had healed and the mastoid was granulating well, and by March 1st was healed also, but there was still offensive discharge from the tympanum. The patient was then discharged to the out-patient department.

As the swelling of the drum-membrane disappeared, a large perforation of Schrapnell's membrane was seen, through which carious bone could be felt within the epitympanum in the region of the head of the malleus; and on March 19th an operation for carious ossicles was done, and the drum-membrane and malleus removed, together with a large quantity of granulations from the fissure of Rivini. The entire head of the malleus had been lost by caries and the neck was still carious; the incus was not found, and had probably been destroyed. The tympanum was syringed every three days, kept packed with aseptic gauze, and in three weeks all discharge had ceased.

One of the most interesting features of the case is the temperature chart, which shows such a slight variation from the normal between the first and second operation, from November 12th to December 13th, notwithstanding a considerable collection of pus on the dura. During this time the only symptoms were one convulsion on November 17th, and constant involuntary urination during sleep only.

This case shows well the complicated nature of these suppurations within the bone; for there were practically three foci of disease, the caries of the antrum-roof with the extra-dural abscess, the necrosis of the labyrinth and the caries of the ossicles, all of which had to be got rid of before the disease was cured.

Four months after the healing the patient remained well and the ear was absolutely dry and free from all swelling.

THE CHEMICAL ANALYSIS OF THE GASTRIC CONTENTS.

I. METHOD OF ANALYSIS FOR USE IN CLINICAL WORK.
II. RECORD OF THE ANALYSES OF THE GASTRIC CONTENTS OF FIFTY HEALTHY INDIVIDUALS.

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I. METHOD OF ANALYSIS FOR USE IN CLINICAL WORK.

To the physician who would utilize the investigation of the products of gastric digestion, as an aid to the diagnosis and treatment of his cases, there are two requisites. These requisites are (1) a reliable method of investigation; (2) a series of results for comparison, obtained by the application of this method to the product of the normal gastric digestion.

The development of a systematic method of investigation is dependent upon the collected knowledge of the subject of gastric digestion in health and disease. This knowledge is, stated briefly, as follows:

The digestion of food in the stomach occurs through the agency of a mineral acid (hydrochloric acid), a proteolytic ferment (pepsin), and a coagulating ferment (rennin), all produced from the glands of the mucous membrane of the stomach. Under the com